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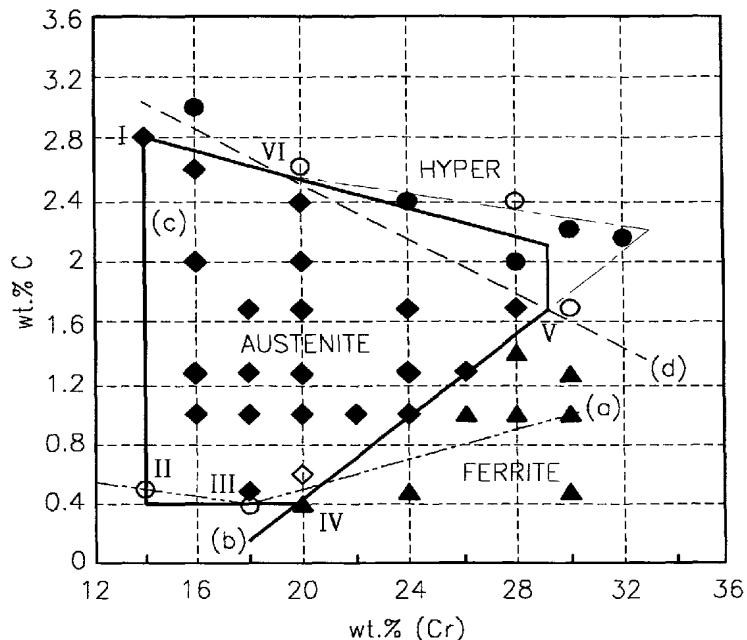
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(54) Title: FE-BASED HARDFACING ALLOY



(57) Abstract: An iron-based (Fe-based) hardfacing alloy is provided. The Fe-based hardfacing alloy has excellent wear resistance, excellent cavitation erosion resistance, and excellent corrosion resistance, thereby being substituted for a cobalt-based (Co-based) stellite alloy, which has been used for the hardfacing of a nuclear power plant valve. When the provided Fe-based hardfacing alloy is used for the hardfacing of the nuclear power plant valve, inexpensive Fe can be substituted for expensive Co and radiation fields formed by 58Co and 60Co radioactive isotopes can be efficiently reduced.

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Fe-BASED HARDFACING ALLOY

Technical Field

The present invention relates to a hardfacing alloy, and more particularly, to an iron-based (Fe-based) hardfacing alloy to be used in various industrial fields including the hardfacing of a nuclear power plant valve.

Background Art

In general, nuclear power plants operate for about one year and then plan pauses of about two to three months in order to replace nuclear fuel and examine and repair the nuclear power plants, more specifically, steam generator tubes. Here, if the steam generator tubes, which form the boundary of a primary system and a secondary system, are broken, radioactive primary system cooling water may flow out. Thus, the state of the steam generator tubes is examined by a non-destructive method and, when necessary, the steam generator tubes are repaired by performing plugging or sleeving. Such examination and repair are performed in a water box at a lower portion of the steam generator tube where radioactive materials are deposited, so nuclear power plant operators can be exposed to radioactive rays. The amount of radioactive exposure for the operators is proportional to the intensity of radiation field and the length of operating time in the radiation field. Accordingly, in order to lower the amount of radioactive exposure, the intensity of the radiation field and the length of the operating time in the radiation field have to be reduced.

Meanwhile, it is known that the radiation field of the primary system in the nuclear power plant is mainly formed by ^{58}Co and ^{60}Co radioactive isotopes, which are generated from worn and corroded

cobalt-based (Co-based) stellite alloy as a hardfacing alloy of valves in the primary system.

Hardfacing as a method for overlaying a material having a high wear resistance on a contacting surface in order to increase the lifespan 5 of a metal component reduces the number of parts that need to be repaired and pause periods for the repair and enables use of an inexpensive base material so that the cost for manufacturing the metal component is reduced. Here, the nuclear power plant valve is hardfacing treated because the nuclear power plant valve is used in a 10 severe wear environment where temperature ranges from 90 to 343°C and a contact stress of 5 to 30 ksi are applied, so galling is likely to occur. Here, galling denotes severe damage on a surface and is likely to occur when metals are worn out under a high load and non-lubricant 15 condition. Due to the galling, the surface roughness of the metal is significantly increased due to macro-plastic deformation on the worn surface. When the galling occurs on the nuclear power plant valve, a contacting surface becomes rough enough that leakage can occur, and the nuclear power plant valve may not operate entirely. Thus, galling of 20 the nuclear power plant valve must be prevented.

The Co-based stellite alloy, which is used as a hardfacing alloy on the nuclear power plant valve, for example, stellite 6, is formed of 5 parts by weight of iron (Fe), 0.4 parts by weight of nickel (Ni), 1.1 parts by weight of carbon (C), 28 parts by weight of chromium (Cr), 2 parts by weight of manganese (Mn), 4 parts by weight of tungsten (W), and the 25 remainder parts of Co. Hereafter, the stellite 6 will be referred to as the stellite alloy. The Co-based stellite alloy is widely used in high-temperature components where severe wear between metals occurs and in fields where a high corrosion resistance is required. However, as Co is a main source of the primary system radiation field, 30 studies on developing a Co-free hardfacing alloy have been conducted.